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Dissemination of the Renewable Energy in the Craftiness Subject in the Junior High School Curriculum

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Abstract

Energy problem is internationally discussed since it seems that the fossil energy reserve is diminishing. Indonesia is located in the equator so it is imbued with a great amount potential energy from non-fossil sources. But, they have not been maximally made use of because of the peoples' daily habits in terms of the energy. Therefore, it is necessary to implant the use of renewable energy into the students' mind, starting from junior high school (SMP) students, by including the renewable energy content into the curriculum, especially in the "Craftiness" (prakarya) subject. It is intended to grow students' attitude in their affective, cognitive ad psychomotoric competence towards the renewable energy.

Keyword. Renewable energy, curriculum, craftiness

INTRODUCTION

Energy plays a vital role in human life. Most human activities really depend on energy. Transportations, lightings, household appliances and industrial machines may not function if energy is unavailable. Due to ever increasing number of human population each year, the demands for energy also increase. On the other hand, human beings are faced with diminishing fossil energy reserves and with environmental damages because of the use of fossil energy.

Based on the fact, specific attention should be given on substituting what is commonly called renewable energy to the fossil energy. A study made in IPCC (2001) identifies four main benefits from the use of the renewable energy: (1) benefits for the environment and the climate; (2) giving more access to energy, especially in rural

areas; (3) increasing job opportunities, and improving the macro economic performance; (4) improving energy security, contributing to a more stable macro-economy.

Indonesia is a strategic country in view of its geographic position. Astronomically, it is passed through by an equator along line Sumatra, Kalimantan, Sulawesi and also east Indonesia islands. The geographic and astronomic position, Indonesia is imbued with a great wealth of renewable energy, though this kind of energy has not been optimally made use of.

In the newspaper *Republika* on August 12, 2014 i,t is stated that ten sources of the renewable energy that may at present be utilized are sun light (solar energy), sea, wind, geothermal, hydropower, hydrogen, bio-ethanol, coal and biomass.

It is the Ministry of Research and Technology that is responsible for creating and utilizing the renewable energy. To support the program, young generations should really have some knowledge on what the renewable energy is, its sources, its importance as substitute for energy at present.

School is an important place to implant any knowledge to students. The curriculum, therefore, should be well planned to support the aim attained by the government. In planning in the curriculum, an integration should be made between institutional and national ideals (Effendi, 2013). The programs on the renewable energy the government have had are good enough if they are integrated into the senior high school curriculum. It is through this curriculum that the learning of the renewable energy may be more early implanted in the students' mind to result in some awareness of and concern with the importance of the renewable energy. In line with Piagets' child development stage, the materials of the renewable energy may be presented to the age level of junior high school students.

Based on the description above, one of the important studies is how to include the "renewable energy" into the junior high school curriculum, specifically into the "craftiness" subject (Cholily, et al, 2016). It is expected that the subject will not merely contain theories but also simple practices on the renewable energy

DISCUSSION

School is a place to study so that students will possess expected behaviors, including giving some knowledge and understanding to improve their awareness of and concern with the use of sources of the renewable energy. It is in line with the Taba's inductive learning model (Commeyras, 1986) that curriculum as a plan of learning is something planned to be studied by students, so the junior high school curriculum should be designed and organized with the load of the renewable energy for the attainment of

the goal of the curriculum. This planning is analogous with Sukmadinata's (2008) statement.

A. Curriculum of Junior High School

Material on energy in the 2013 curriculum in SMP has been included into the Natural Science (IPA) subject, but the material on the renewable energy is not described in detail because the it is not described because the Natural Science subject should also include biology and chemistries subjects (Permendikbud No. 68, 2013). The development of the basic competence will give effects on the development of teaching materials.

As a result it is necessary to organize the junior high school curriculum to prevent any overloading and overlapping teaching materials. This will cause teachers and students be able to attain the goal of the curriculum more easily. Curriculum should be well-planned, and is arranged systematically and in a systematic way, since it has played conservative, creative and critical and evaluative roles (Hamalik, 2008: 65 and Sanjaya, 2008: 40).

B. Renewable Energy in Indonesia

Due to the development of human life, the level of the need for energy will also increase. The fulfillment of the demand is mostly from burning un-renewable million-aged fossil fuel and some from the use of other sources of renewable energy. Actually in Indonesia, such a renewable energy has been being used for thousands years ago, for instance fire wood is used as the source of renewable energy because trees can always be planted again.

Indonesia is a country rich with natural resources, including the potency to fulfill its energy for the people. But the natural resources are not well managed as the energy potency to develop the people's civilization. In fact at present our nation faces crises of energy either for fulfilling the fuels or electrical energy. This is because the Indonesian people's knowledge and understanding of the renewable energy are still low. So, it is necessary to implant what a renewable energy is and how to create such a renewable energy among the people in the world of education as clearly stated in the national curriculum.

C. The Potency of the Renewable Energy in Indonesia

Indonesia possess a great potency of the renewable energy sources. Some of the energy sources that have been utilized in small scales among others are bio-ethanol as the substitute for gasoline, biodiesel for diesel oil, solar energy, wind energy, micro-hydro, even waste. They may be used to power electric plants. Based on the data of the potency of the new renewable energy, as stated by the Director for the New Renewable Energy and Energy Conservation in a Focus Group Discussion program on the Supply-Demand of the New Renewable Energy of the mini/micro hydro of 450 MW, Biomass supplies 50 GW, Solar energy, 4.80 kWh/m2/day, wind energy 3-6m/sc and nuclear energy 3 GW. On the basis of the great richness of resources, Indonesia should not suffer from any energy scarcity.

1. Solar Energy

Indonesia as a tropical country has a great potency of solar energy. This kind of energy may be made used of every from 07.00 – 14.00 every day. Based on the data of the sun radiation collected from 18 locations in Indonesia, it is known that the solar radiation in Indonesia may be classified into western and eastern Indonesia areas in terms of its radiation distribution (Lubis, 2007)

a) Western Indonesia Areas = 4.5 kWh/m^2 day, with monthly variation of about 10%.
b) Eastern Indonesia Areas (KTI) = 5.1 kWh/m^2 day, with monthly variation of about 9%
c) Average = 4.8 kWh/m^2 day, with monthly variation of about 9%.
d) From the data, it is known that the solar radiation may be obtained in the whole year, especially in the Eastern Indonesia area.

Solar energy may be utilized through two types of technology, thermal solar and photovoltaic solar energies. b. Thermal Solar Energy

Commercially, most thermal solar energy is used to provide heat water for households, especially those in urban areas. It is estimated that the number of the thermal solar energy of water heaters is 150,000 units with the total width of the solar heat collectors of 400.000 m2.

a**.** Photovoltaic Solar Energy

It is known as solar cell or *photovoltaic cell*, which is a semiconductor device has wide surface and consists of a series of type p and n diode that may directly change solar energy into electrical energy.

2. Water Energy

Indonesia has a very great potency to develop hydropower plants, because the geographic condition of Indonesia is surrounded by mountains and hills and passed through by rivers. Even in certain areas, there are many lakes/basins with a great potency in providing such water energy. At present, hydropower plants are innovations in the field of technology that prove not to harm the environment by making use of the renewable energy. Moreover, micro-hydro energy has also been developed in Indonesia. The capacity of the micro-hydro energy is 200-5,000 KW, but its potency is 458.75 MW (Lubis, 2007). It is liable to develop this micro-hydro energy to fulfill the need for electricity in rural areas along narrow river streams.

3. Wind Energy

It is a relatively clean and friendly-environmental energy, but its use in Indonesia is still in a small scale. Its average minimum speed that may economically developed as the energy provider is 4m/sc (Lubis, 2007). It is necessary to map areas with continuous and adequate potency of wind in the whole year.

4. Geothermal Energy

Indonesia has a very great geothermal potency namely around 27.000 MW that may be directly and indirectly utilized. At present this geothermal energy has been used for

new electric power plants of 807 MW or about 3 of the total existing potency. The Law no. 27 year of 2003 is legalized to support the development of geothermal energy where in the Blue Print, in 2020, geothermal energy-powered plants will reach 6.000 MW.

5. Biomass/Biogas

Biomass is a primary source of energy with a great potency in Indonesia, resulted from the natural richness in the form of the tropical forest vegetation. Biomass is changed into electricity or heat in a technological process. Besides wood, a great amount of biomass wastes from the industrial processing of forest, agriculture and plantation has not been well made use of.

Solid biomass waste from forestry, agriculture and plantation sectors is the most potential waste than the rice, corn, cassava, coconut, palm, and sugar cane wastes. Then potency of the solid biomass waste in Indonesia is 49,807.43 MW. Besides the solid biomass waste, biogas energy may be generated from animal waste, namely feces from cows, buffalos, horses and also pigs that may be found out in the whole provinces in Indonesia in different quantities. The use of the biomass and biogas energy in all Indonesia is about 167.7 MW coming from sugar cane waste and 9.26 from the gasification process, respectively. The cost invested on the biomass is around 900-1400 dollar/kW and the cost for the energy is IDR 75-250/kW.

D. The Craftiness of Renewable Energy in Junior High School

Junior high school is a formal school providing its students with knowledge to continue their studies into either secondary high schools or vocational high schools. The structure of the junior high school or its equivalent consists of general subjects group A and B. The subjects in group A are the subjects of which the loads and references are developed by the central government, while those in group B developed by the central government and maybe complemented with local contents, including the craftiness subject (Permendikbud No. 58, year of 2014).

Craftiness is a subject included in the group B category, so there is a big chance to provide the subject with the renewable energy (Chollyet al, 2016). It is analogous with McNeil's (2006) idea that a curriculum should be able to fulfill the people's need in this case the government' s need. Therefore, students are demanded to be creative, to have wide but efficient insights in attaining the learning goal of learning (Darling-Hammond, et all, 2005).

Craftiness is a subject providing students with some competence in making a craft. It is through this subject that their cognitive and psychomotor competences are flourished. Therefore, this subject should include three domains of age as stated in the 2013 curriculum namely attitude, knowledge and competence. Its learning is designed based on activities dealing with a number of the craftiness domain such as handicraft, technology, processing and cultivation works from popular work themes relevant for junior high school students.

There are many renewable energies that may be included into the 'craftiness subject in junior high school level. In inductive learning, for example, materials on the renewable energy from a preliminary stage such as introducing steps in stringing it up to the more complex ones such as creating it, may be given. For example, students are introduced to an energy from solar cell. They are taught how to string up the solar cell, to calculate the solar cell capability in order to be able to power electrical energy. Then they are taught how the energy is saved in a battery. The stages and the techniques are in line with the statement made by Udelhofen (2005).

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